

U.S. Patent Application Serial No. 09/423,436
Amendment dated January 26, 2004
Reply to OA of October 28, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended) A sliding bearing for supporting an opposing shaft movable in a sliding direction against said sliding bearing, said sliding bearing comprising:

a backing metal, and

a copper alloy consisting essentially of

copper,

from 0.1 to 2% by weight of Ag, and

from 1 to 10% by weight of Sn,

said alloy bonded to said backing metal, and having on its side opposite to the backing metal a roughened surface of approximately 0.5 to approximately 10 μm of roughness (Rz);

said alloy having a first layer parallel to and adjacent to said backing metal, and a second layer ~~that is not directly adjacent to said backing metal~~ first layer;

wherein said roughened surface is coated with a coating layer comprising at least one thermosetting resin, which is selected from the group consisting of polyimide resin, polyamide-imide resin, epoxy resin and phenol resin, and which contains from 55 to 95% by weight of MoS_2 , and wherein said roughened surface is formed of grooves extending in the sliding direction;

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wherein Ag and Sn are solid solution in the copper alloy without forming a secondary phase of Ag and Sn in at least the area of said second layer directly adjacent said roughened surface; and,

wherein said second layer contains a second-layer component consisting of one of:

solid solution of Ag and Sn,

a hexagonal compound of solid solution of Ag and Sn,

a hexagonal compound of Cu and solid solution of Ag and Sn,

a eutectic of solid solution of Ag and Sn, or

a eutectic of Cu and solid solution of Ag and Sn;

in higher concentration of Ag and Sn than that of said first layer.

Claim 2 (currently amended): A sliding bearing for supporting an opposing shaft movable in a sliding direction against said sliding bearing, said sliding bearing ~~consisting essentially of a copper alloy containing~~ comprising:

a copper alloy consisting essentially of

copper,

from 0.1 to 2% by weight of Ag, from 1 to 10% by weight of Sn, and

10% by weight or less of at least one additive element selected from the group consisting of Sb, In, Al, Mg and Cd,

said alloy bonded to a backing metal and having on its side opposite to the backing metal a roughened surface of approximately 0.5 to approximately 10 μm of roughness (Rz); and

said alloy having a first layer parallel to and adjacent to said backing metal, and a second layer ~~that is not directly adjacent to said backing metal~~ first layer;

wherein said roughened surface is coated with a coating layer comprising at least one thermosetting resin, which is selected from the group consisting of polyimide resin, polyamide-imide resin, epoxy resin and phenol resin, and which contains from 55 to 95% by weight of MoS₂, and wherein said roughened surface is formed of grooves extending in the sliding direction;

wherein Ag and Sn and said at least one additive element are solid solution in the Cu matrix of the copper alloy without forming a secondary phase of Ag and Sn and said additive element in at least the area of said second layer directly adjacent said roughened surface;
and,

wherein said second layer contains a component consisting of at least one of:

solid solution of Ag and Sn and at least one of said additive elements,

a hexagonal compound of solid solution of Ag and Sn and at least one of said additive elements,

a hexagonal compound of solid solution of Cu and Ag and Sn and at least one of said additive elements,

a eutectic of solid solution of Ag and Sn and at least one of said additive elements, or

a eutectic of Cu and solid solution of Ag and Sn and at least one of said additive elements;
in higher total atomic concentration of Ag and Sn and said additive element than that of said first layer.

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Claim 3 (canceled)

Claim 4 (previously presented): A sliding bearing according to claim 1, wherein said roughened surface is further roughened by shot-blasting, etching, flame-spraying or chemical treatment.

Claim 5 (previously presented): A sliding bearing according to claim 1, wherein said roughened surface is formed by shot-blasting, etching, flame-spraying or chemical treatment of a surface of grooves extending in the sliding direction.

Claim 6 (previously presented): A sliding bearing according to claim 1, wherein the average particle diameter of said MoS₂ is 15 μ m or less.

Claim 7 (previously presented): A sliding bearing according to claim 1, wherein said coating layer further contains one or more of a solid lubricant, extreme pressure agent and friction adjusting agent.

Claim 8 (canceled).

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Claim 9 (previously presented): A sliding bearing according to claim 2, wherein said roughened surface is further roughened by shot-blasting, etching, flame-spraying or chemical treatment.

Claim 10 (previously presented): A sliding bearing engine according to claim 2, wherein said roughened surface is formed by shot-blasting, etching, flame-spraying or chemical treatment of a surface of grooves extending in the sliding direction.

Claim 11 (previously presented): A sliding bearing according to claim 1, wherein the concentration of Ag and Sn in said second layer of said second-layer component is at least 1.3 times higher than that of said first layer.

Claim 12 (previously presented): A sliding bearing according to claim 2, wherein the concentration of Ag and Sn in said second layer of said second-layer component is at least 1.3 times higher than that of said first layer.

Claim 13 (New): A sliding bearing according to claim 1, wherein the first layer is formed 30 μm from the surface of the copper alloy before use.

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Claim 14 (New): A sliding bearing according to claim 2, wherein the first layer is formed
30 μm from the surface of the copper alloy before use.